

## PATENT COOPERATION TREATY

PCT

## NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Commissioner  
 US Department of Commerce  
 United States Patent and Trademark  
 Office, PCT  
 2011 South Clark Place Room  
 CP2/5C24  
 Arlington, VA 22202  
 ETATS-UNIS D'AMERIQUE  
 in its capacity as elected Office

<b>Date of mailing</b> (day/month/year) 03 November 2000 (03.11.00)	
<b>International application No.</b> PCT/AU00/00248	<b>Applicant's or agent's file reference</b>
<b>International filing date</b> (day/month/year) 24 March 2000 (24.03.00)	<b>Priority date</b> (day/month/year) 24 March 1999 (24.03.99)
<b>Applicant</b> CAULFIELD, R.	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:  
 20 October 2000 (20.10.00)

☐ in a notice effecting later election filed with the International Bureau on:  
 \_\_\_\_\_

2. The election ☒ was

☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

<b>The International Bureau of WIPO</b> 34, chemin des Colombettes 1211 Geneva 20, Switzerland  Facsimile No.: (41-22) 740.14.35	<b>Authorized officer</b>  Charlotte ENGER  Telephone No.: (41-22) 338.83.38
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**PATENT COOPERATION TREATY**  
**PCT**  
**INTERNATIONAL PRELIMINARY EXAMINATION REPORT**

(PCT Article 36 and Rule 70)

20 FEB 2001  
PCT

Applicant's or agent's file reference <b>FP*QUICKM2</b>	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416).	
International Application No. <b>PCT/AU00/00248</b>	International Filing Date ( <i>day/month/year</i> ) <b>24 March 2000</b>	Priority Date ( <i>day/month/year</i> ) <b>24 March 1999</b>
International Patent Classification (IPC) or national classification and IPC  <b>Int. Cl. <sup>7</sup> B01D21/26</b>		
Applicant <b>QUICKWATER PTY LTD et al</b>		

1.	This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.																
2.	This REPORT consists of a total of <b>3</b> sheets, including this cover sheet.  <input checked="" type="checkbox"/> This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).  These annexes consist of a total of <b>5</b> sheet(s).																
3.	This report contains indications relating to the following items: <table style="width: 100%; margin-top: 10px;"> <tr> <td style="width: 5%;">I</td> <td><input checked="" type="checkbox"/> Basis of the report</td> </tr> <tr> <td>II</td> <td><input type="checkbox"/> Priority</td> </tr> <tr> <td>III</td> <td><input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</td> </tr> <tr> <td>IV</td> <td><input type="checkbox"/> Lack of unity of invention</td> </tr> <tr> <td>V</td> <td><input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</td> </tr> <tr> <td>VI</td> <td><input type="checkbox"/> Certain documents cited</td> </tr> <tr> <td>VII</td> <td><input type="checkbox"/> Certain defects in the international application</td> </tr> <tr> <td>VIII</td> <td><input type="checkbox"/> Certain observations on the international application</td> </tr> </table>	I	<input checked="" type="checkbox"/> Basis of the report	II	<input type="checkbox"/> Priority	III	<input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability	IV	<input type="checkbox"/> Lack of unity of invention	V	<input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement	VI	<input type="checkbox"/> Certain documents cited	VII	<input type="checkbox"/> Certain defects in the international application	VIII	<input type="checkbox"/> Certain observations on the international application
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Date of submission of the demand <b>20 October 2000</b>	Date of completion of the report <b>7 February 2001</b>
Name and mailing address of the IPEA/AU  AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaaustralia.gov.au Facsimile No. (02) 6285 3929	Authorized Officer   <b>G. Carter</b> Telephone No. (02) 6283

**I. Basis of the report**

1. With regard to the **elements** of the international application:\*
- ☐ the international application as originally filed.
- ☒ the description, pages **2,4-9** , as originally filed,  
pages , filed with the demand,  
pages **1,3** , received on **25 January 2001** with the letter of **25 January 2001**
- ☐ the claims, pages , as originally filed,  
pages , as amended (together with any statement) under Article 19,  
pages , filed with the demand,  
pages **10-12** , received on **25 January 2001** with the letter of **25 January 2001**
- ☐ the drawings, pages **1-8** , as originally filed,  
pages , filed with the demand,  
pages , received on with the letter of
- ☐ the sequence listing part of the description:  
pages , as originally filed  
pages , filed with the demand  
pages , received on with the letter of
2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.  
These elements were available or furnished to this Authority in the following language which is:
- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).
3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, was on the basis of the sequence listing:
- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished
4. ☐ The amendments have resulted in the cancellation of:
- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/fig.
5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).\*\*

\* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

\*\* Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement****1. Statement**

Novelty (N)	Claims <b>1-21</b>	<b>YES</b>
	Claims	<b>NO</b>
Inventive step (IS)	Claims <b>1-21</b>	<b>YES</b>
	Claims	<b>NO</b>
Industrial applicability (IA)	Claims <b>1-21</b>	<b>YES</b>
	Claims	<b>NO</b>

**2. Citations and explanations (Rule 70.7)**

This invention relates to a separator for use in marine craft to separate sand /grit from sea water and stop sand from finding its way into the lubricating grooves of the propeller bearing.

None of the citations disclose a separator with a sleeve mounted over a rotating shaft and with the particles and fluid exiting from the same end opposite the inlet. All the citations also require the orientation of the separators to be vertical for separation and collection of particles from the fluid whereas the separator of the invention need not be vertically oriented since the solids are not collected in the separator.

## A SEPARATOR

### FIELD OF THE INVENTION

The present invention relates to a separator for separating particles from a fluid.

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### BACKGROUND

In many marine craft, a propeller at the end of a drive shaft extends away from the craft's stern by out rigging via a bearing. The bearing is usually cooled and lubricated by water flowing through channels or grooves which extend through the bearing. When the marine vessel passes through water where sand or grit has been disturbed, the sand/grit particles can find their way into the lubricating grooves of the bearing. These particles are highly abrasive to the bearing, and result in the bearing quickly becoming worn.

There is therefore a need to minimise the amount of sand or other abrasive particles from entering the lubricating grooves of the bearing.

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### SUMMARY OF THE INVENTION

An object of the present invention is to provide a separator for separating particles entrained in a fluid.

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In accordance with a first aspect of the present invention there is provided a separator for separating particles entrained in a fluid, said separator including:

a sleeve adapted to be mounted over a rotatable shaft for forming a cavity therebetween;

25

an inlet to the cavity;

an outlet to the cavity opposite the inlet; and

means for imparting a centrifugal force on fluid within the cavity, said means operatively connected to the shaft so that, in use, spinning of the shaft creates the centrifugal force,

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wherein, in use, a slurry of fluid and particles enters the cavity through the inlet, the particles are caused to separate from the fluid by action of the centrifugal force, the separated particles and fluid leave the cavity via the outlet with the particles tending to be

Preferably, the sleeve is arranged to rotate about its axis relative to the parting means.

Preferably, the outer layer is ejected from a first exit of the outlet. Preferably, the parting means includes a turbulence means for slowing the exit of the fluid carrying the particles  
5 from the outlet.

Preferably, the parting means is arranged to be fixed to a bearing.

Preferably, the parting means includes a scoop means for scooping the inner layer of fluid  
10 away from the blade to a second exit of the outlet.

Preferably, the scoop means is in the form of a plurality of curved channels. Preferably, the scoop means is provided with a second raceway between the curved channels and the second exit.  
15

According to a second aspect of the present invention, there is provided a separator and parting means combination, the separating means as defined above and the parting means is arranged to partition an inner layer of fluid substantially devoid of particles from an outer layer of fluid carrying the particles.  
20

According to a third aspect of the present invention, there is provided a separator, parting means and a bearing combination, the separator and parting means as defined above, the bearing arranged to receive the inner layer of fluid from the parting means.

## 25 DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

In order to provide a better understanding, preferred embodiments of the present invention will now be described in detail, by way of example only, with reference to the accompanying diagrams in which:

Figure 1 is a cross sectional side view of a separator in accordance with the present  
30 invention;

Figure 2 is a complete cross sectional end view of the separator as would be seen from the section X-X of Figure 1;

**CLAIMS**

The claims defining the invention are as follows:

1. A separator for separating particles entrained in a fluid, said separator including:  
5 a sleeve adapted to be mounted over a rotatable shaft for forming a cavity therebetween;  
an inlet to the cavity;  
an outlet to the cavity opposite the inlet; and  
means for imparting a centrifugal force on fluid within the cavity, said means  
10 operatively connected to the shaft so that, in use, spinning of the shaft creates the centrifugal force,  
wherein, in use, a slurry of fluid and particles enters the cavity through the inlet, the particles are caused to separate from the fluid by action of the centrifugal force, the separated particles and fluid leave the cavity via the outlet with the particles tending to be  
15 closer to the sleeve than the shaft.
2. A separator according to claim 1, wherein the cavity increases in cross-sectional area along its length from the inlet towards the outlet.
- 20 3. A separator according to claim 1, wherein the sleeve is frustoconical in shape with the narrow end of the cone at the inlet and a wide end at the outlet, whereby the size of the cavity increases along its length from the inlet to the outlet.
4. A separator according to claim 1, wherein said means is in the form of one or more  
25 paddles projecting from the shaft into the cavity.
5. A separator according to claim 1, wherein the inlet is of a smaller area than the outlet.
- 30 6. A separator according to claim 1, where in the cavity is of a helical shape.
7. A separator according to claim 6, wherein said helical shape of the cavity acts as

said means for imparting centrifugal force.

8. A separator according to claim 1, wherein the outlet includes a chamber at the end  
outlet of the cavity between the sleeve and the shaft, the chamber arranged to receive a  
5 parting means for portioning an inner layer of fluid substantially devoid of the particles  
from an outer layer of fluid carrying the particles.

9. A separator according to claim 1, wherein said outlet includes a parting means  
arranged to portion an inner layer of fluid substantially devoid of the particles from an  
10 outer layer of the fluid carrying the particles.

10. A separator according to claim 9, wherein the parting means is in the form of a blade  
closely encircling the shaft.

15 11. A separator according to claim 9, wherein the sleeve is arranged to rotate about its  
axis relative to the parting means.

12. A separator according to claim 9, wherein the outer layer is ejected from a first exit  
of the outlet.

20 13. A separator according to claim 12, wherein the first exit includes a turbulence means  
for slowing the exit of fluid carrying particles from the first exit.

14. A separator according to claim 9, wherein the parting means includes a scoop for  
25 scooping the inner layer of fluid away from an edge of the blade to a second exit of the  
outlet.

15. A separator according to claim 14, wherein the scoop is in the form of a plurality of  
channels in the parting means.

30 16. A separator according to claim 6, wherein a first raceway is provided between the  
inlet and the helical cavity.

17. A separator according to claim 15, wherein a second raceway is provided between the channels in the parting means and the second exit.

5 18. A separator and parting means combination, the separator as defined in claim 1, wherein the parting means parts an inner layer of fluid substantially devoid of particles from an outer layer of fluid carrying particles.

19. A separator and bearing combination, the separator as defined in claim 1, the  
10 bearing arranged to receive fluid substantially devoid of particles from close to the shaft from the outlet of the separator.

20. A separator, parting means and a bearing combination, the separator and parting  
15 means as defined in claim 18, the bearing arranged to receive the inner layer of fluid from the parting means.

21. A separator, parting means and a bearing combination according to claim 19, wherein the bearing is provided with a sieve means on an opposite side of the bearing to the separator.

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/AU 00/00248

<b>A. CLASSIFICATION OF SUBJECT MATTER</b>												
Int Cl <sup>7</sup> : B01D 21/26												
According to International Patent Classification (IPC) or to both national classification and IPC												
<b>B. FIELDS SEARCHED</b>												
Minimum documentation searched (classification system followed by classification symbols) B01D 21/26, B63H												
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched												
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) WPAT; (SAND or CENTRIGU or SHAFT) and B63H; (CYLIND or SHAFT or PROPEL or SHROUD or SAND) and B01D 21/26												
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>												
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.										
X	US 4448688 A (HAULIS) 15 May 1984	1-21										
X	WO 93/11847 A (VORTECH INTERNATIONAL INC) 24 June 1993	1-21										
X	EP 37347 A (CENTRE DE L'INDUSTRIE DES PAPIER) 13 March 1981	1-21										
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C <input type="checkbox"/> See patent family annex												
<p>* Special categories of cited documents:</p> <table border="0"> <tr> <td>"A" Document defining the general state of the art which is not considered to be of particular relevance</td> <td>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</td> </tr> <tr> <td>"E" earlier application or patent but published on or after the international filing date</td> <td>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</td> </tr> <tr> <td>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</td> <td>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</td> </tr> <tr> <td>"O" document referring to an oral disclosure, use, exhibition or other means</td> <td>"&amp;" document member of the same patent family</td> </tr> <tr> <td>"P" document published prior to the international filing date but later than the priority date claimed</td> <td></td> </tr> </table>			"A" Document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention	"E" earlier application or patent but published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone	"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art	"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family	"P" document published prior to the international filing date but later than the priority date claimed	
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"P" document published prior to the international filing date but later than the priority date claimed												
Date of the actual completion of the international search 13 April 2000		Date of mailing of the international search report - 3 MAY 2000										
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200 WODEN ACT 2606 AUSTRALIA E-mail address: pct@ipaustalia.gov.au Facsimile No.: (02) 6285 3929		Authorized officer  G. CARTER Telephone No.: (02) 6283 2154										

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/AU 00/00248

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 95/33572 A (SAGET) 9 June 1995	1-21
X	DE 2810306 A (BEETZSEN) 9 March 1978	1-21

